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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

FAULK, DEVONA E

ART UNIT	PAPER NUMBER
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2644

DATE MAILED: 10/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/367,153

Applicant(s)

SIBBALD ET AL.

Examiner

Devona E. Faulk

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 September 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 15-53 is/are pending in the application.
- 4a) Of the above claim(s) 44 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 15-43 and 45-53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Response to Arguments

2. Applicant's arguments, filed 0/21/04, with respect to the rejection(s) of claim(s) 15-43, and 45-53 under 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Begault (3D Sound for Virtual Reality and multimedia).

Claim Rejections - 35 USC § 112

3. Claims 15-17,23,24,34,40,45-47,50-52 recites the limitation "magnitude" in line 13 of claim 15; line 14 of claim 16; line 14, of claim 17; line 13 of claim 23; line 15 of claim 24; line 12 of claim 34; line 13 of claim 45; line 14 of claim 46; line 14 of claim 47; line 14 of claim 50; line 14 of claim 51; and line 14 of claim 52. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. **Claims 15,16,18,20,24,26,28,30,34,40,45,46,48,50** are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (page 2, line 23; Figure 8) in view of Begault (3D Sound For Virtual Reality and Multimedia).

Claims 15-17,23,34,40,45-47,50-52 share common features.

Regarding **claims 15-17,23,24,34,40,45-47,50-52** the applicant's admitted prior art discloses a method of processing a single channel audio signal corresponding to a sound from a sound source located at a source position relative to a preferred position of a listener comprising providing a right channel signal and a left channel signal from said single channel audio signal (Figure 8; page 2, line 23); modifying each of said right channel signal and said left channel signal using at least one of a plurality of head response transfer functions (Figure 8; page 2, line 23); introducing a time delay between said right channel signal and said left channel signal to provide cues to perception of a direction of said source position relative to said preferred position of said listener at a given time, said time delay corresponding to an inter-aural time difference of said sound from said sound source with respect to said listener (Figure 8). The applicant's admitted prior art fails to disclose choosing respective values for magnitude as claimed.

However this concept was well known in the art as taught by Begault. Begault discloses in Figures 2.14 and 2.15 (pages 46-48), the concept of having different magnitudes for the left and right ear based on distance. The inter-aural time difference, as taught by the applicant's admitted prior art (Figure 8), describes the time delay between sounds arriving at the left and right ears. However, as shown by Begault (Figure 2.14, page 47), the magnitude components of the HRTFs to the left and right ears for a given virtual location, in this case left 90° azimuth, are

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different; the one, in this case, for the right ear is clearly, less than that for the left or closer ear. Thus, one of ordinary skill would realize that in general, an interaural time difference (ITD) will also have associated with it an interaural intensity difference, i.e., a difference in the magnitude of each HRTF. An ITD thus means a time difference and a magnitude difference (generally) and it is clear that the greater distance has a lesser magnitude.

Claim 15 differs in that it recites "said respective values for magnitude of said left channel signal and said magnitude of said right channel signal being chosen separately, each based on the distance from the sound source to the respective one of the left and right ears of the listener. The examiner notes that the last paragraph of claim 15, which does not imply the existence of a separate step or structure to impart a magnitude difference to HRTFs, is inherently met by typical HRTFs for left and right ears. Thus employing such typical HRTFs inherently amounts to choosing said respective values of magnitude as claimed.

Regarding **claim 16**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above apropos of claim 15, with the exception of "said respective values for magnitude of said left signal and said magnitude of said right signal being determined on an inverse of square of distance between said source position and respective ears of said listener". Begault teaches of the inverse square law for intensity vs. distance (Figure 3.1; page 70-71). It is obvious that since distances can be determined from the gain, that the reverse is true and the magnitude can be determined from the distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use sound's inverse square law for intensity vs. gain in order to determine the coordinates of the external sound source.

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All elements of **claim 18** are comprehended by claim 16. Therefore, claim 18 is rejected for reasons given above apropos of claim 16.

Regarding claim 20, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 15, with the exception that at least one of said left signal and said right signal is sufficiently small as to be inaudible. This would be a matter of choice as to if one wanted one of the signals to be inaudible. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to make one of signals inaudible for the benefit of having sound produced to one ear.

Regarding **claim 24**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception that there is a computer readable storage medium having a program with instructions. Begault further teaches the concept of a program that enables the process. There obviously would have to be a computer readable medium of some sort to enable the program to run. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use a computer program to implement the processing is for the benefit of producing a more robust virtual sound image.

Claim 26 claims the computer readable storage of claim 24. Regarding **claim 26**, the combination of the applicant's admitted prior art and Begault meet all elements of that claim, as stated above in apropos of claim 15, with the exception that the respective values for magnitude of said left signal and said magnitude of said right signal are determined based on an inverse of square of a distance between source position and respective ears of listeners. Begault teaches of distances determined by the sound intensities using the inverse square law for intensity vs.

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distance (Figure 3.1. pages 70-71). It is obvious that since distances can be determined from the gain, that the reverse is true and the magnitude can be determined from the distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use sound's inverse square law for intensity vs. gain in order to determine the coordinates of the external sound source.

All elements of **claim 28** are comprehended by claim 24. Therefore, claim 24 is rejected for reasons given above apropos of claim 24.

Regarding **claim 30**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 24, with the exception that at least one of said left signal and said right signal is sufficiently small as to be inaudible. This would be a matter of choice as to if one wanted one of the signals to be inaudible. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to make one of signals inaudible for the benefit of having sound produced to one ear.

Regarding **claim 34**, the combination of the applicant's admitted prior art and Begault meet all elements of that claim, as stated above in apropos of claim 15, with the exception that there is an apparatus performing the method. All elements of claim 34 are the same as those of claim 15. Therefore claim 34 is rejected for reasons given above apropos of claim 15.

Claim 36 claims the apparatus of claim 34. Regarding **claim 26**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 15, with the exception that the respective values for magnitude of said left signal and said magnitude of said right signal are determined based on an inverse of square of a distance between source position and respective ears of listeners. Begault teaches of distances

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determined by the sound intensities using the inverse square law for intensity vs. distance. It is obvious that since distances can be determined from the gain, that the reverse is true and the magnitude can be determined from the distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use sound's inverse square law for intensity vs. gain in order to determine the coordinates of the external sound source.

All elements of **claim 38** are comprehended by claim 36. Therefore, claim 36 is rejected for reasons given above apropos of claim 36.

Regarding **claim 40**, the combination of the applicant's admitted prior art and Begault meet all elements of that claim, as stated above in apropos of claim 34, with the exception that at least one of said left signal and said right signal is sufficiently small as to be inaudible. This would be a matter of choice as to if one wanted one of the signals to be inaudible. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to make one of signals inaudible for the benefit of having sound produced to one ear.

Regarding **claim 45**, Begault also reads on "said respective values for magnitude of said left signal and said magnitude of said right signal are being chosen separately". It is obvious that you would use the respective values of magnitude of the left and right signal to provide cues for perception of the source position from the preferred position at said given time because the goal is to achieve the best possible and most accurate sound. Thus, it would have been obvious to one of ordinary skill in the art to choose respective values of magnitude of said left and right channel as claimed in order to provide improved virtual sound images.

Regarding **claim 46**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above apropos of claim 15, with the exception of "said

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respective values for magnitude of said left signal and said magnitude of said right signal being determined on an inverse of square of distance between said source position and respective ears of said listener". Begault teaches of distances determined by the sound intensities using the inverse square law for intensity vs. distance (Figure 3.1, pages 70-71). It is obvious that since distances can be determined from the gain, that the reverse is true and the magnitude can be determined from the distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use sound's inverse square law for intensity vs. gain in order to determine the coordinates of the external sound source.

All elements of **claim 48** are comprehended by claim 46. Therefore, claim 48 is rejected for reasons given above apropos of claim 46.

Regarding **claim 50**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 15, with the exception that at least one of said left signal and said right signal is sufficiently small as to be inaudible. This would be a matter of choice as to if one wanted one of the signals to be inaudible. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to make one of signals inaudible for the benefit of having sound produced to one ear.

6. **Claim 17,19,23,25,27,29,35,37,39,47 and 49** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Begault (3D Sound For Virtual Reality and Multimedia) in further view of Raydon et al. (U.S. Patent 3,969,588).

Regarding **claim 17**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 15, with the exception of the

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step of choosing respective values for magnitude of said left signal and magnitude of said right signal comprises providing a look-up table having thereon distances between said source position and respective ears of said listener, said distances corresponding to associative ones of said values for magnitude of said left signal and said magnitude of said right signal and selecting said values for magnitude from said look-up table. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. It would have been obvious to use Raydon's concept of having a look-up table to retrieve values for the benefit of reducing processing time.

Claim 19 claims the method of claim 18, wherein said step of choosing respective values for magnitude of said left signal and magnitude of said right signal further comprise providing a look-up table having therein values of magnitude corresponding to distances between said source position and respective ears of said listener and selecting said values for magnitude from said look-up table bases on said interaural time difference. The inter-aural time difference, as taught by the applicant's admitted prior art (Figure 8), describes the time delay between sounds arriving at the left and right ears. It is well known in the art that inter-aural time difference is a source of localization cues. The applicant's admitted prior art teaches of the interaural delay. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable

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operations. It would have been obvious to use Raydon's concept of having a look-up table to retrieve values for the benefit of reducing processing time.

Regarding **claim 23**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 15, with the exception that the respective magnitudes are determined by reference to a lookup table using the inter-aural time delay to determine the respective values for magnitude". Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. It would have been obvious to use Raydon's concept of having a look-up table to retrieve values for the benefit of reducing processing time.

Claim 25 claims the computer readable storage of claim 24. Regarding **claim 25**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 15, with the exception that the respective magnitudes are separately determined by using an inter-aural time difference as an input parameter for a lookup table having magnitude values based on the distance from the sound source to the respective one of the left and right ears of the listener. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. It would have been obvious to use Raydon's concept of having a look-up table to retrieve values for the benefit of reducing processing time.

Claim 27 claims the computer readable storage of claim 24. As stated above apropos of claim 24, the combination of the applicant's admitted prior art and Begault meets all elements of that claim. Therefore, the combination meets all elements of claim 27 with the exception that the instructions for choosing respective values for magnitude of said left signal and magnitude for said right signals include instructions for providing a look-up table having thereon distances between said source position and respective ears of said listener, said distances corresponding to associative ones of said values for magnitude of said left signal and said magnitude of said right signal and selecting said values for magnitude from said look-up table. Raydon discloses a look-up table having gain reads on the claimed matter. Begault further teaches the concept of using a program to perform the processing (Figure 5,15; pages 179-181). Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. There would obviously have to be a computer readable medium. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use a computer program to implement the processing is for the benefit of producing a more robust virtual sound image.

Claim 29 claims the computer readable storage of claim 24. As stated above apropos of claim 28, the combination of the applicant's admitted prior art and Begault meets all elements of that claim. Therefore, the combination meets all elements of claim 27 with the exception that the instructions for choosing respective values for magnitude of said left signal and magnitude for said right signals include instructions for providing a look-up table having thereon distances between said source position and respective ears of said listener, said distances corresponding to associative ones of said values for magnitude of said left signal and said magnitude of said right

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signal and selecting said values for magnitude from said look-up table. Raydon discloses a look-up table having gain reads on the claimed matter. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. It would have been obvious to modify the apparatus of the combination of the applicant's admitted prior art and Tanner by having a look-up table to retrieve values for the benefit of reducing processing time.

Claim 35 claims the apparatus of claim 34, wherein said means for choosing said respective values is adapted to choose said respective values for magnitude of said left signal and said magnitude of said right signal separately by using an inter-aural time difference as an input parameter for a lookup table having magnitude values based on the distance from the sound source to the respective one of the left and right ears of the listener. As stated above apropos of claim 34, the combination of the applicant's admitted prior art and Begault meet all elements of that claim. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). It would have been obvious to use Raydon's concept of having a look-up table to retrieve values for the benefit of reducing processing time.

Claims 37 and 39 claim the method of claims 34 and 38 respectively, wherein said means for choosing respective values for magnitude of said left signal and magnitude of said right signal further comprises a look-up table having thereon values for distances between said source position and respective ears of said listener, said distances corresponding to associative ones of said values for magnitude of said left signal and said magnitude of said right signal; means for selecting said values for magnitude from said look-up table. The inter-aural time difference, as taught by the applicant's admitted prior art (Figure 8), describes the time delay

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between sounds arriving at the left and right ears. It is well known in the art that inter-aural time difference is a source of localization cues. The applicant's admitted prior art teaches of the interaural delay. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. It is obvious to have a means to retrieve the data. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. It would have been obvious to use Raydon's concept of having a look-up table to retrieve values for the benefit of reducing processing time.

Regarding **claim 47**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 45, with the exception said respective values for magnitude of said left signal and magnitude of said right signal are chosen by selecting said values for magnitude from a look-up table having thereon distances between said source position and respective ears of said listener, said distances corresponding to associative ones of said values for magnitude of said left signal and said magnitude of said right signal and selecting said values for magnitude from said look-up table. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. It would have been obvious to use Raydon's concept of having a look-up table to retrieve values for the benefit of reducing processing time.

Claim 49 claims the audio signal of claim 48, wherein said respective values for magnitude of said left signal and magnitude of said right signal are chosen by selecting values for magnitude from said look-up table having thereon values for distances between said source position and respective ears of said listener, said distances corresponding to associative ones of

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said values for magnitude of said left signal and said magnitude of said right signal. The interaural time difference, as taught by the applicant's admitted prior art (Figure 8), describes the time delay between sounds arriving at the left and right ears. It is well known in the art that interaural time difference is a source of localization cues. The applicant's admitted prior art teaches of the interaural delay. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. It would have been obvious to use Raydon's concept of having a look-up table to retrieve values for the benefit of reducing processing time.

7. **Claims 21,31,41 and 51** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Begault (3D Sound For Virtual Reality and Multimedia) in further view of Abel et al. (U.S. Patent 6,009,178).

Regarding **claim 21**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 15, with the exception of the left signal and the right signal are compensated to provide at least one of a cancellation and a reduction of transaural crosstalk when said left signal and said right signal are supplied through said left channel and said right channel respectively for replay by loudspeakers. Abel teaches of a system and method for providing a two-channel signal to the ears of a listener through an audio system comprising a crosstalk removal circuit (303; Figures 3A and 3B). Transaural means to deliver binaural signals to the ears of a listener using stereo loudspeakers. Therefore, Abel's system reads on the claimed matter. Crosstalk cancellation is well known in the art and is essential and critical to all head-related transfer function (HRTF) based 3D sound systems.

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Thus it would have been obvious to one of ordinary skill in the art at the time of filing to use transaural crosstalk for the benefit of delivering clean left and right channel binaural signals to the ears of the listener.

Regarding **claim 31**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 24, with the exception that the left signal and the right signal are compensated to provide at least one of a cancellation and a reduction of transaural crosstalk when said left signal and said right signal are supplied through said left channel and said right channel respectively for replay by loudspeakers. Abel teaches of a system and method for providing a two-channel signal to the ears of a listener through an audio system comprising a crosstalk removal circuit (303; Figures 3A and 3B). Transaural means to deliver binaural signals to the ears of a listener using stereo loudspeakers. Therefore, Abel's system reads on the claimed matter. Crosstalk cancellation is well known in the art and is essential and critical to all head-related transfer function (HRTF) based 3D sound systems. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. Thus it would have been obvious to one of ordinary skill in the art at the time of filing to use transaural crosstalk for the benefit of delivering clean left and right channel binaural signals to the ears of the listener.

Claim 41 claims the apparatus of claim 34 further comprising a compensating means for providing at least one of a cancellation and a reduction of transaural crosstalk in said left signal and said right signal when said left signal and said right signal are supplied through said left channel and said right channel respectively for replay by loudspeakers. Abel teaches of a system and method for providing a two-channel signal to the ears of a listener through an audio system

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comprising a crosstalk removal circuit (303; Figures 3A and 3B). Transaural means to deliver binaural signals to the ears of a listener using stereo loudspeakers. Therefore, Abel's system reads on the claimed matter. Crosstalk cancellation is well known in the art and is essential and critical to all head-related transfer function (HRTF) based 3D sound systems. Thus it would have been obvious to one of ordinary skill in the art at the time of filing to use transaural crosstalk for the benefit of delivering clean left and right channel binaural signals to the ears of the listener.

Regarding **claim 51**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 45, with the exception that said left signal and the right signal are compensated to provide at least one of a cancellation and a reduction of transaural crosstalk when said left signal and said right signal are supplied through said left channel and said right channel respectively for replay by loudspeakers. Abel teaches of a system and method for providing a two-channel signal to the ears of a listener through an audio system comprising a crosstalk removal circuit (303; Figures 3A and 3B). Transaural means to deliver binaural signals to the ears of a listener using stereo loudspeakers. Therefore, Abel's system reads on the claimed matter. Crosstalk cancellation is well known in the art and is essential and critical to all head-related transfer function (HRTF) based 3D sound systems. Thus it would have been obvious to one of ordinary skill in the art at the time of filing to use transaural crosstalk for the benefit of delivering clean left and right channel binaural signals to the ears of the listener.

8. **Claims 22, 32,33,42,43,52 and 53** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Begault

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(3D Sound For Virtual Reality and Multimedia) in further view of Sibbald et al. (U.S. Patent 5,666,425).

Regarding **claim 22**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 15, with the exception of combining said left signal and said right signal with other two or more channel audio signals. Sibbald discloses plural sound processing where a left and right channel (36 and 38) are added to equalized left and right signal (44 and 46) using adders 48 and 50. This reads on "combining said left and said right signal with other two or more channel audio signals". Combining signals is well known in the art. It would have been obvious to combine the signals as claimed for the benefit of producing a left and right combined signal.

Regarding **claim 32**, the combination of the applicant's admitted prior art and Begault meet all elements of that claim, as stated above in apropos of claim 24, with the exception of computer readable medium including an instruction for combining said left signal and said right signal with other two or more channel audio signals. Sibbald discloses plural sound processing where a left and right channel (36 and 38) are added to equalized left and right signal (44 and 46) using adders 48 and 50. This reads on "combining said left and said right signal with other two or more channel audio signals". Combining signals is well known in the art. It would have been obvious to combine the signals as claimed for the benefit of producing a left and right combined signal.

Claim 33 claims the computer readable storage medium of claim 32, wherein said set of instructions for combining said left and right channel with two or more channel audio signals comprises a set of instructions for combining adding respective contents of said left channel and

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said right channel to corresponding channels of said other two or more channel signals. The combination of the applicant's admitted prior art, Begault and Sibbald meet all elements of claim 22. Combining the signals as claimed in 32 inherently includes adding respective contents of said left and said right channel as claimed. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the left and right signals with two or more other channel audio signals for the benefit of producing a left and right combined signal.

Regarding **claim 42**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 34, with the exception of the apparatus further comprising a means for combining said left signal and said right signal with other two or more channel audio signals. Sibbald discloses plural sound processing where a left and right channel (36 and 38) are added to equalized left and right signal (44 and 46) using adders 48 and 50. This reads on "combining said left and said right signal with other two or more channel audio signals". Combining signals is well known in the art. It would have been obvious to combine the signals as claimed for the benefit of producing a left and right combined signal.

Claim 43 claims the computer readable storage medium of claim 42, wherein said means combining comprises means for adding respective contents of said left channel and said right channel to corresponding of said other two or more channel signals. The combination of the applicant's admitted prior art, Begault and Sibbald meet all elements of claim 42. Combining the signals as claimed in 32 inherently includes adding respective contents of said left and said right channel as claimed. Thus it would have been obvious to one of ordinary skill in the art at

the time of the invention to combine the left and right signals with two or more other channel audio signals for the benefit of producing a left and right combined signal.

Regarding **claim 52**, the combination of the applicant's admitted prior art and Begault meets all elements of that claim, as stated above in apropos of claim 45, with the exception of combining said left signal and said right signal with other two or more channel audio signals. Sibbald discloses plural sound processing where a left and right channel (36 and 38) are added to equalized left and right signal (44 and 46) using adders 48 and 50. This reads on "combining said left and said right signal with other two or more channel audio signals". Combining signals is well known in the art. It would have been obvious to combine the signals as claimed for the benefit of producing a left and right combined signal.

Claim 53 claims the audio signal of claim 52, wherein said step of combining adding respective contents of said left channel and said right channel to corresponding channels of said other two or more channel signals. The combination of the applicant's admitted prior art, Begault and Sibbald meet all elements of claim 52. Combining the signals as claimed in 52 inherently includes adding respective contents of said left and said right channel as claimed. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the left and right signals with two or more other channel audio signals for the benefit of producing a left and right combined signal.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Devona E. Faulk whose telephone number is 703-305-4359. The examiner can normally be reached on 8 am - 5 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W. Isen can be reached on 703-305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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